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A system, and a corresponding method, for providing a home entertainment device with a modified programme channel. The modified programme channel comprises a schedule of programmes on a programme channel, having modified programme breaks within and/or between the programmes. The system comprises: a programme reception device to receive the programmes on the programme channel; a source of supplementary programme material; output means, coupled to the programme reception device and to the source of supplementary programme material, to output the scheduled programmes and supplementary programme material to the home entertainment device; programme break detection means (such as a clock and/or event handler), coupled to the programme reception device, to detect a break or interruption in a programme; and switching means, responsive to the programme break detection means to switch the output from the programme to the supplementary programme material. Preferably the home entertainment device is a television.

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Electronic Programme Break Replacement System

The present invention generally relates to systems for the management of programmes for home entertainment devices such as televisions. More particularly it is concerned with apparatus, methods and software for replacing breaks in such programmes.

Until recently conventional televisions have been able to receive only a relatively limited number of channels of programmes. Typically terrestrial television broadcasting has provided 4 or 5 channels, satellite broadcasting of the order of a dozen channels and cable television broadcasting a few tens of channels. With the advent of new forms of programme delivery such as digital terrestrial television (DTT), digital satellite television, web casting - delivery of programmes over the Internet - and video-on-demand (VOD) and near video-on-demand (NVOD) the number of available television channels is predicted to grow dramatically. Consumers will be able to choose from many thousands of programmes or programme clips, which could include daily video magazines, regularly updated news from hundreds of sources around the globe, music tracks and videos, games and films. Newer PC-TVs and set-top-boxes (STBs) have the ability to store programmes on an internal hard disk for viewing later and to access web-cast video over the Internet, as well as having the capability to receive many hundreds of channels of broadcast material and NVOD movies. Thus consumers will be faced with an overwhelming choice of viewing.

Television viewers exhibit both "push" and "pull" behaviour. In push behaviour a passive viewer selects a channel, typically by editorial style much as one might choose a newspaper, and is essentially passive thereafter. Pull behaviour is where a viewer deliberately chooses or "pulls" a desired programme, for example a video, soap,

sporting fixture or well-advertised/trailed programme. Viewers may even pay for such material.

The advent of intelligent television receivers and set-top boxes (STBs) with inbuilt storage and processing power allow intelligent switching of channels between and within TV programmes. These developments may have a radical effect on the TV paradigm, and in particular negate the assumption that the passive viewer is captured by a particular broadcasting channel.

EP-A-0 878 964 describes a virtual information selection system with means for identifying and learning preferences of an information consumer. An advertising mode is utilised for providing information to consumers in which they have specified a particular interest. EP-A-0 772 360 describes video data receiving apparatus, video data transmitting apparatus and a broadcasting system. Programme data is outputted whilst appropriately inserting stored commercials. EP-A-0 536 628 describes selection of compressed television signals from single channel allocation based on viewer characteristics. US 5,715,400 describes a system and method for providing merchant information and establishing links to merchants while presenting a movie.

The various aspects of the present invention are aimed at providing a viewer with programme and supplementary programme information which is potentially better aligned with what the user would like or be interested to see.

According to one aspect of the present invention there is provided a system, and a corresponding method, for providing a home entertainment device with a modified programme channel. The modified programme channel comprises a schedule of programmes on a programme channel, having modified programme breaks within and/or between the programmes. The system comprises: A programme reception device to receive the programmes on the programme channel; a source of supplementary programme material; output means, coupled to the programme reception device and to the source of supplementary programme material, to output the scheduled programmes

and supplementary programme material to the home entertainment device; programme break detection means (such as a clock and/or event handler), coupled to the programme reception device, to detect a break or interruption in a programme; and switching means, responsive to the programme break detection means to switch the output from the programme to the supplementary programme material. Preferably the home entertainment device is a television.

This allows delivery of advertising material by a route different to that of the programme material, and allows personalised advertisements, chosen according to viewer preferences and demographics to be delivered, possibly from a third party source.

The system allows a user or programme or service provider to replace programme breaks or interruptions due to commercial advertising or the intervention of other programmes, with material which is supplementary to the programmes, such as targeted advertising. Where the system comprises local storage such programme breaks may also, if desired, be eliminated entirely by displaying a time-delayed version of the programme channel. The system may include a clock for timed control of switching.

The apparatus and method can advantageously be used in the context of apparatus and/or methods for providing a home entertainment device with a virtual or personal channel. Such a virtual or "personal" channel may comprise a sequence of programmes from multiple programme sources, chosen according to the user's taste or specifications. The system and methods described allow further tailoring of such a virtual channel to more closely match a specific user's habits or requirements.

Advantageously sources of supplementary programme material include NVOD video, material available via the Internet, and locally stored supplementary programme material.

A source of supplementary programme material may be predefined, for example, in firmware by a set top box supplier or by a service provider downloading source definition information to a user. Alternatively the source of supplementary programme material is selected automatically in response to collected and locally or remotely stored user preference or descriptor information.

A user descriptor can be based upon user input parameters, user identity data and/or the user's recent viewing history. A separate, user-specific advertisement stream may also be included in the personal channel schedule, either timed according to the user's preferences or automatically, for example between programmes.

The system preferably stores a user description and the supplementary programme source can be selected in response to this so that a personal channel can be switched to a defined advertising or programme break source, for example, to deliver more specifically targeted or personalised advertising. If a previously stored programme is being viewed the apparatus can be arranged to allow the user the option of skipping over a programme or commercial break.

Preferably the source of supplementary programme material comprises the programme reception device and the switching means switches the programme reception device from the programme channel to a second channel to receive the supplementary programme material. Alternatively the source of supplementary programme material comprises a second programme reception device and the switching means switches to selectively couple one of the programme reception devices to the output means. The switching means may be further responsive to a programme reception device to switch back from the supplementary programme material to the programme.

These and other aspects of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 shows a block diagram of apparatus embodying the present invention;

Figure 2 conceptually illustrates the concept of a virtual channel;

Figure 3 shows an on-screen electronic programme guide for a virtual channel;

Figure 4 shows a relational database for storing programme data;

Figure 5 shows a user interface for searching the database of Figure 4;

Figure 6 shows a block diagram of software modules for an electronic programme scheduling system;

Figure 7 shows, schematically, parts of a user interface; and

Figure 8 shows apparatus for programme break replacement.

Figure 1 shows one example of electronic programme guide (EPG) apparatus which is suitable for providing a home entertainment device, such as a television, with a virtual or personal channel. The programme break replacement system will generally operate in the context of such a system which will therefore be described in detail. An EPG is, generally speaking, an application resident on a set top box designed to aid the viewer in the navigation of and selection from broadcast material available in a digital TV environment. A virtual personal channel comprises, generally speaking a preferably seamless schedule of material from any available broadcast channels, automatically selected for maximum relevance to a set of parameters defined by the viewer. A set top box automatically re-tunes to each broadcast channel as required, providing the effect of a single channel.

Logically the apparatus of Figure 1 is located between a programme source such as a terrestrial television programme transmitter and a television receiver; physically it may be incorporated within a television set. In outline it is based upon hardware corresponding to a conventional personal computer system with the addition of components for television programme reception and processing and modifications to enable the computer to be embedded in a conventional set top box (STB) with infrared remote control. Much of the functionality is provided by firmware stored in read only memory (ROM), although the program could be stored on hard disk, where the STB is so equipped, and executed from random access memory (RAM). The configuration of

the computer system can be varied to suit the level of desired functionality. The illustrated system is suitable for a processor which performs multimedia operations (such as a Pentium with MMX) but a simpler microcontroller could be used and the basic functionality required of the system could even be provided by dedicated hardware. The skilled person will recognise that many variations to the illustrative hardware can be made according to cost, component availability, system functionality and other considerations. Although the apparatus will be described as providing programmes to a television, it is suitable for use with any home entertainment device such as a VCR or DVD recorder and, in general, any programme receiving device.

In Figure 1 the set top box is generally illustrated at 10 and comprises a microprocessor 12 coupled to random access memory (RAM) 14, ROM 16 and peripheral component interconnect (PCI) bridge 20 by processor bus 18. ROM 16 holds system BIOS (Basic Input Output System) and operating software, the BIOS interfacing between the operating software and the STB hardware. If desired, the BIOS ROM can instead be coupled to the processor via the low speed ISA bus 44. PCI bus 22 is driven by PCI bridge 20 and is suitable for high speed data transfer although it is slower than processor bus 18. Optionally, hard/floppy disk controller 26 and disk drive 28, and digital versatile disk (DVD) drive and controller 30 are coupled to the processor via the PCI bus 22. To the ISA bus is attached non-volatile RAM 32 for storing, for example, user input information; real time clock 34; smart card interface 36 for smartcard 37 and infrared control link device 38. Commands are issued to the set top box by the user using a hand held infrared remote control unit 40 or infrared keyboard 41 which communicates with control link device 38.

Industry standard architecture (ISA) bus 44 is coupled to PCI bus 22 by ISA bus bridge 42. The system is preferably provided with means to receive television programmes from a variety of sources such as broadcast programmes from satellite, cable and conventional terrestrial transmitters, video or near-video-on-demand (both referred to as NVOD) sources, and Web cast programmes from Internet-based sources. However, a simplified system may lack such receiving means and may instead control

the television to display a desired programme, for example by transmitting infrared commands to the transmitter as though it were the television's remote control device; in this case IR module 38 may also be an IR transceiver.

In Figure 1, conventional tuner 60 has input 62 coupled to a terrestrial television aerial to receive terrestrially broadcast programmes; cable television receiver 56 has input 58 coupled to a cable TV network; satellite receiver 52 has input 54 coupled to a satellite receiving dish; and digital terrestrial receiver 57 has input 55 from a suitable terrestrial aerial. Telephony modem 46, which may be a cable modem, or an International Subscriber Digital Network (ISDN) or an asymmetric digital subscriber line (ADSL) modem (or any suitable digital subscriber line device) is coupled to telephone line 50 to receive VOD/NVOD programmes. Digital programme receiving devices have their digital information stream output coupled to decode unit 66 (audio paths are not shown in Figure 1), which is also coupled to ISA bus 44 or PCI bus 22.

Television programmes may have associated data streams and the programme receiving means are therefore preferably provided with means to receive data and/or to extract data from received video signals which can, for example, be included in the vertical blanking interval (VBI) of a television signal. Since the ADSL connection provides a data channel, this can also be used for data communications. Such connections allow the system to handle data casting and to extract programme data such as broadcast channel identification information, time and date information and subtitles.

The apparatus is preferably configured to view programme video information and simultaneously browse the Web and carry out Web related activities, for example downloading software or information.

An audio and motion video compression module 64 is also coupled to bus 18 and may also be implemented in software. Data may be input to this to allow broadcast programmes to be recorded locally and made available for later viewing. The video data is compressed according to a standard format such as MPEG, Real Media or H323 and

then stored as a compressed file on disk. Module 66 also includes corresponding decoding means to decompress the compressed video and audio. Optionally, the video compression and decompression can be performed by processor 12. The system is preferably operable to concurrently store a received programme and to play a stored programme by, for example, interleaving write and read-erase access cycles to the storage module's disk drive.

A video output carrying programme information, is coupled to the television via graphics adapter/video signal combiner 70, and modulator 72. If the television has a direct video input, modulator 72 may be omitted and the television 74 may be connected directly to video output via a SVGA socket, a SCART socket, S-Video socket, RCA phono plugs or other well known interfaces. Video RAM 70 is connected to the processor bus 18 and allows the system to generate graphics and combine them with the digital signal from video decode 66, for example using overlay or picture-in-picture modes, and can also output a video signal without any additional graphics. The system is configured to directly overlay text and/or graphics onto programme video and to achieve a similar result by overlaying a sparse Web page. This information can, for example, be used to provide further information about the programme or channel currently being viewed, for example information on "What's on next".

The system also includes an event detector module implemented in software to detect events in a programme video stream such as programme breaks within and/or between programmes. Such breaks or interruptions can be caused by commercial advertising or the interruption of other programmes for example news programmes. For example, in the U.K. a pair of vertical bars appears in the top right hand corner of the picture frame as a video switching mark shortly before a commercial break and the event detector is configurable to provide the video decode responsive to programme break detection. For digital transmissions, appropriate digital descriptor information is used to detect programme change.

The event detector can monitor events in any of the incoming video streams and either control the video switch directly or provide information to processor 12 for control of the video switch so that a programme break, such as a commercial, can be replaced by a source of supplementary programme material from one of the other programme receiving means. This may be termed microscheduling. The system is also configurable for the event detector to control the display of graphics information, for example displaying a Web page, either alone or with picture-in-picture or overlaid video, when the event occurs.

For example, if tuner 60 is providing ITV1, commercial breaks can be replaced by supplementary material from a cable channel from receiver 56, which could be defined by the set top box supplier or a programme service provider or by information previously downloaded or downloaded with the programme. Video switch output 67, initially coupled to the output of tuner 60, is coupled to the output of cable receiver 56 whilst switch output 69 continues to monitor the output of tuner 60 so that the event detector can provide a signal to control the video switch to switch output 67 back to tuner 60 at the end of the commercial break; alternatively the system can switch back after a predetermined time interval.

If only a single programme receiving means is present in the apparatus, this can be controlled to switch to a source of supplementary programme material such as a source of alternative commercials on detection of a programme break such as a commercial break, or to internally generated video, such as stored news, games or program schedule information and to switch back to the original programme again after a predetermined period or when an event is detected in the supplementary programme material video stream. Information determining the supplementary programme source channel may also be predefined, for example in firmware, or based upon information characterising a user of the apparatus, as described in more detail below.

Events can be determined by absolute and/or relative times, for example "at 10 p.m." or "five seconds after the start of the BMW advert(Registered Trade Mark)".

Events, and the systems response to them, can be defined by extensions to HTML information associated with the relevant programmes. For example, in accordance with the recommendations of the Advanced Television Enhancement Forum (ATVEF) recommendations on proposed HTML extensions. The events and responses can also be transmitted in-band, for example in the VBI as a subtitle (the US EIA 746 standard) or in a digital video stream as a subtitle or as a separate event object in the data carousel, or even can be separately input via some other online connection.

The system is preferably equipped with bi-directional communications, so that information can be both received from and transmitted to remote apparatus. Thus cable receiving means 56, phone modem 46 are preferably all operable to transmit data as well as to receive programme and data information. Thus conventional Web-browser software in firmware may be employed to allow a user to interact with Web pages via the Internet, for example using IR remote control 40 to select hypertext links on Web pages displayed to the user by graphics adapter 70. Programme descriptor information can be displayed with selectable/clickable extensions and, more generally, Web-based electronic programme guide (EPG) information can be displayed. Although the operating system software has been described as being stored in ROM, it may be stored in non-volatile memory such as FLASH memory (EEPROM) whereby the system can be updated by downloading new software over one or other of the communication links, either when it becomes available or when a user pays to upgrade the system.

Also shown in Figure 1 is a database 76 remote from the set top box and comprising database storage means 78 and bi-directional communications link 80 for communication with the set top box (STB). Although shown remote from the apparatus, the programme database may be incorporated within the apparatus either in memory or on the local hard disk and generated from broadcast programme information. The database is provided with a software interface based on a standard protocol such as ODBC (Open Database Connectivity), for connection to other elements of the system. Again, although the database is illustratively shown as a unitary structure it could also comprise information held in a large number of disparate sources, for example

electronic programme guides at various different Web page URL's. A further alternative is that the database is held remotely, as illustrated, with a copy of the database held locally in the set top box, for example, on disk or in the NVRAM and periodically updated by file transfer, for example, by telephone dial-up on demand or at a fixed time daily or by data insertion in the broadcast signal, for example overnight in in-band data such as VBI inserted data for analogue TV or as part of the data carousel for digital TV. Communication with the database can be by any conventional means, for example by phone modem 46 and/or a copy or partial copy of the database can be downloaded to the STB using the satellite 52, digital 57 and/or cable 56 receiver(s). The information held in the programme database is described in more detail below.

A virtual channel is a schedule of programmes which have been selected from programmes available from real channels or other programme sources (for example, Webcast programmes). The schedule is made up by selecting programmes from a variety of channels for showing in, preferably, defined time slots in the virtual channel. The concept of a virtual channel is illustrated diagrammatically in Figure 2. Figure 2 shows a virtual channel schedule 90 and schedules for four real channels, 91, 92, 93 and 94. The real "channels" may include cable, satellite, terrestrial and Web-cast television channels and NVOD programmes.

Illustratively the virtual channel 90 has a template structure with notional divisions at half hour intervals defining half hour time slots 82 for programme scheduling. Time slots of other lengths can also be defined and, more generally, a flexible structure can be adopted in which the time slots are of varying length, preferably with start and end times corresponding to start and end times of programmes on a real channel(s).

The real channels have programmes 84 of variable start time and duration scheduled as shown. In the illustrated example, the virtual channel schedule comprises five programmes, A, B, C, E and E during the interval 18:00 hours to 22:30 hours. Programme A is scheduled to occupy the slot from 18:00 hours 18:30 hours on the

virtual channel; it is available on real channel 93 during the same interval and therefore a system for providing the virtual channel must select programme information from channel 93 for output during this time period.

The second time slot in the virtual channel begins at 18:30 hours and programme B, available on channel 92, is scheduled for this time slot. Programme B ends at 19:00 hours, which corresponds with the end of the time slot on the virtual channel, but it starts after 18:30 hours, leaving a gap in the virtual channel schedule. This gap may be filled either by programme material from channel 93 following programme A or by programme material from channel 92 preceding programme B, or by a supplementary programme material. Such supplementary material may comprise advertising from a standard source, material from a source defined by the virtual channel schedule information, or material from a source automatically chosen by the system according to available information (such as information describing the programmes in the virtual channel schedule or information describing or characterising a system user or user preferences). It may include material previously recorded on a local storage device. Since, by definition, VOD programmes are effectively available on-demand, gaps and overlaps in the virtual channel schedule can be adjusted by adjusting the start time of VOD programmes in the schedule.

Programme C from channel 94 is scheduled for the third illustrated half-hour time slot on the virtual channel, and programme D from channel 93 is scheduled for the following four time slots. It can be seen that programmes C and D overlap and, in the illustrated example, programme D has taken priority over programme C in the virtual channel schedule. Programme overlaps can be handled either by manually choosing which programme takes priority, or by pre-programmed rules. For example, the earlier or the later programme may always take precedence or rules can depend upon programme related information such as programme genre which allows rules such as "movies take priority over news" to be defined. In a preferred embodiment the system has a basic set of in-built rules which can be modified by the user.

As described above, when the set top box includes means to receive more than one programme at once and when it includes motion video storage means, overlapping programmes such as C and D may be scheduled at different times or to run consecutively. For example, programme C could be scheduled for both slots between 19:00 hours and 20:00 hours then, whilst, from 19:30 onwards C is being provided to the television, the initial half hour of D is recorded, and then after 20:00 hours the initial part of D is output to the television whilst the later part of D is concurrently recorded. This concurrent playback and recording is continued to move the end of programme D and the start of programme E to approximately 22:00 hours. The system is operable in a similar way to prevent a virtual channel schedule being disrupted by a programme which is broadcast at a later time (or an earlier time) than that at which it is initially described as being available. The actual broadcast time of a programme can be determined by video stream events and/or from data downloaded by the system and by concurrent recording and playback the whole schedule can be shifted back in time until a suitable gap or lower priority programme is encountered.

If desired, more than one consecutive programme from a real channel can be scheduled on the virtual channel, and in this case it is convenient to provide means whereby a user can map a portion of virtual channel 90 to a corresponding portion of a real channel. It is preferably also possible to fully map the virtual channel to a real channel so that, for example, virtual channel 90 may be defined as identical to real channel 93.

Although the scheduled entities have been referred to as programmes, other similar entities such as computer games, computer based learning activities and interactive telecommunication events may also be scheduled.

The information defining the virtual channel schedule comprises, at its most basic, an ordered list of programme entities. Associated with each entity is information specifying a real channel or other programme source, including other virtual channels, from which the channel entity is available. Preferably the virtual channel schedule

information comprises, for each scheduled programme, information identifying the start time of the programme as well as information identifying a real channel on which the programme is available at that start time. Programme duration information may also be included. In the case of NVOD programmes the "real channel" information comprises NVOD programme source information.

The operating software in the ROM 16 of the set top box uses information defining the virtual channel schedule to control the set box top to provide the set scheduled programmes to output 74 to the television at the correct times. At a programme start time processor 12 selects the appropriate programme input means and real channel and logically couples the video stream to output 67 or the video switch and thence to the output 74 of the set top box. The video output is provided to the television so that the output video stream can be selected in the same way that other real channels on television are selected. In one embodiment the modulator 72 provides a UHF radio frequency output to the television and when the television is tuned to this frequency the programmes scheduled on the virtual channel are provided so that to a user the virtual channel is selectable so that it appears to another real channel.

Figure 3 shows an exemplary screen display 100 presented to the television user when the virtual channel is selected. The display comprises a background region 102, which may be plain or which may include logos and/or advertising material, and a picture-in-picture region 104 in which a currently selected video stream 105 is displayed. A programme information region 106 is provided with a header bar 108 identifying the currently selected virtual channel and a programme guide region 110 displaying a list of programmes and times. Predefined or soft menu buttons 112 are also provided for control of, *inter alia*, scheduling and electronic programme guide functions.

Screen display 100 may be downloaded as a Web page or may comprise locally generated graphics or may be a combination of these; if display 100 is a Web page, screen regions such as menu buttons 112 may include hypertext links to other Web

pages. In a preferred embodiment, selecting region 108, for example by clicking on the region with a pointer, displays a list of channels including real and virtual channels; selecting region 110 changes the display of programme information, displaying programmes at other times and/or further information on a selected programme; and selecting region 105 expands the video to fill the screen.

The system includes input means to receive information, as described above, defining the virtual channel schedule. In a simple system, the input means comprises a communications device such as phone modem 46 or cable receiver 56 together with a software driver operating together to allow a schedule to be downloaded from a remote location such as a critic's choice Web page thus a user could, for example, download a newspaper's recommended choice of viewing for the evening. Smart card interface module 36 can similarly be used to load virtual channel schedules from a user's or a published Smart card (i.e. a card incorporating a silicon chip data storage module).

Preferably the operating software includes software to allow a user to define a virtual channel schedule to create a "personal" channel. For this mode of operation the system includes an interface means (hardware and/or software) to communicate with the programme database, as outlined above. To allow user scheduling of programmes the database must include programme time and channel information needed to construct the personal channel schedule as well as information identifying the programmes to be scheduled, for example programme titles.

The database may be held locally or remotely from the apparatus, for example at a regional head-end delivery point. In cable systems with a permanent connection normal remote access protocols can be used to download the data via some out-of-band data path, for example using a cable modem. Alternatively, both a local and a remote database can be used, with the local database as a mirror of the remote master database.

To allow the user to make an informed choice of programmes for scheduling the database preferably also comprises programme descriptor information characterising the

content of the programmes in the database so that the user can search the database for programmes of a desired type or having specific features. Figure 4 shows an example schema 120 for a relational programme database. Associated with each programme in a "programme" table 122 are programme I.D., programme name, duration, source, production company, viewer's rating, critic's rating, genre, parental marking (age suitability/certification; violence or bad language; religion; nudity) language, indication of the presence of sub-titles, sub-title language, plot synopsis, summary, short description, long description, and other fields such as producer and director can also be included. Other illustrative linked tables include "stars" 124, "actors and actresses" 126, "comments" 128, "cast" 130, "crew" 132, "techies" 134, "series" 136, "programme segment" 138, "programme, and URLs" 140 (identifying, for example, an NVOD programme source). The links 142 between the tables in the relational database indicate which tables share data.

The data can be manually entered into the database or derived from a standard electronic programme guide feed or retrieved from broadcasters' or other Web pages using Web-spider search techniques or can be derived from a combination of these sources. If a Web-spider search engine is used, it is desirable that the EPG data to be collected by the Web-spider is published in a standard format so that the information corresponding to the various fields in the database can easily be located.

In an exemplary embodiment the Web-spider (which is essentially a software module) begins at a starting Web page, which may be predefined or manually entered. This page is searched for programme information for the database and for hypertext links to other Web pages, preferably using key words to identify the potentially most useful links. The search engine then either follows a single link to a new Web page where again electronic programme guide data and further hypertext links are gathered, or the software creates two or more separate tasks to follow a plurality of hypertext links simultaneously. In this way EPG data is gathered as the search engine works its way through a tree of hypertext links. When a dead end is reached the search engine works back up the tree until an unused link is found.

Although a notional tree of links is constructed, in reality there is no tree-like hierarchy amongst the Web pages searched and, theoretically, such a strategy allows virtually the entire Web to be searched. If desired, searching can be made more efficient by including a list of URLs or links to pages where it is known that EPG data is located, or to pages which are known to include links to useful EPG pages, and the search engine can be configured to search these first or to search to a limited depth from these predefined pages. Again, the predefined pages can, for example, be manually entered or downloaded from a manually updated source.

An exemplary embodiment of the system includes a user interface for definition of a personal channel scheduled by the user and/or for tailoring or alteration of a predefined or downloaded virtual channel schedule. Figure 5 shows an exemplary screen display 150 for such a user interface, which allows the user to search the programme database according to user defined criteria and to display programmes matching the criteria, either for immediate showing, or for recording for later viewing, or for scheduling on a personal channel. User interface 150 for capturing the users input and displaying the results, can be a Web-browser extended for TV use, for example in accordance with the recommendations of the Advanced Television Enhancement Forum (ATVEF).

In the example, knobs 152 are used to dial up criteria which appear in display windows 154. Thus a first window may be used to select a genre such as a movie, the second window an associated theme such as "western", a third window, "stars" and a fourth window "John Wayne". A more advanced user interface can also include means to enter key words for word, name, subject, and /or title word searches to allow user for example, to make a request such as "I want to watch gardening programme about heritage tomatoes".

Example search criteria include programme name, star, genre (i.e. programme type such as movie, documentary, news bulletin), theme (e.g. western, comedy,

gardening), key words and description, critic's/viewers' ratings, source or broadcast channel (e.g. BBC1), parental guidelines (e.g. "No nudity", or "before 9 p.m."), language.

The system operating software searches the database using standard database query techniques according to the user defined criteria. After the criteria has been dialled-up or entered, a list of programmes and related information (title, time, duration, description etc) appears in window 156 and button 158 can be used for additional searching/programme display.

The system can also include means to identify a current user of the set top box. In one embodiment this is provided by a login screen where a user name and password must be entered before other elements of the operating system can be accessed. Since the system is aware of the user's identity, the viewing and/or scheduling of programmes can be restricted in accordance with the current user. For example, channel descriptor bar 108 in Figure 3 can be selectable to list channels available to a current user. In an alternative embodiment, only one or a few users need enter a password and all the non-password protected users are subject to viewing/scheduling restrictions. This arrangement allows parental control guidelines to be set by a nominated user, such as the account holder, or other users of the set top box.

Parental control may include or exclude programmes with markings that indicate certain categories, such as nudity, violence, religion, bad language, gambling, alcohol or substance abuse, and all set time constraints, for example, "before 9 p.m.", or "not more than one hour per day or five hours per week". This is achieved by storing data linking a user identity (either a specific named user or a class such as "non-password user") with programme channel and/or descriptor information. If a number of personal channels are shared between a number of users, separate user defined sets of personal channels may also be specified.

The system may also include input means to receive other user information, in addition to user identity information; this may be stored locally or remotely. In particular, the system is capable of receiving preference information characterising a user's preferred programmes. This can be based on information directly entered by a user or on information characterising the user's history of usage of the system, for example, generalisations using AI (Artificial Intelligence) techniques, based upon locally stored viewing statistics. User entered preference information may describe explicit user preferences (for example, "I like westerns") or may be based upon more general information characterising the user, such as their socio-economic class. Preference information can also be derived from "voting", in which the user specifies programmes which have been enjoyed and/or disliked.

The system software preferably allows a user the option of making a personal channel schedule available for transmission to a remote destination. This allows targeted marketing by a service provider and the exchange of virtual channel schedules, either explicitly defined or as preference data sets, to be exchanged between users in different locations, for example between friends and neighbours. Preferably schedule information can be downloaded to a Smart card which the user can then carry around, for example to allow the viewing of preferred personal channels on a hotel television. The Smart card need only carry the user's identity if the user's information is remotely accessible either from a home set top box or from a central database.

A block diagram 200 illustrating modules of the operating software of the system is shown in Figure 6. Programme database 210 receives data from Web-search engine 214 coupled to World Wide Web (Internet) 230, and also data from data feed 211. Virtual channel scheduling is carried out by scheduler 214, which interacts with programme database 210, and controls Web-search engine 212. This receives inputs from real-time clock and events handling software drivers 216 and user preference information/parameters and virtual/personal channel description data from module 218.

The scheduler 214 also interacts with display engine 220, which controls the display of images on the television, and which preferably incorporates a Web-browser. The display engine interacts with tuner control module 224 to control the programme receiving means to provide programmes to the set top box output. It also receives user input from module 228 for scheduling programmes on a personal channel and for direct control of programmes provided to the television. Optionally a payment management module is also included to manage subscription payments to allow programme choices to be made from subscription channels, and to periodically download billing data for pay-per-view programmes.

Figure 7 schematically shows elements of a user interface to the system and links between these elements which allow a user to navigate through the displayed menus and screens. The user enters at login screen 252 which, as described above, restricts access to the system. Once the user has successfully logged-on a multi-channel programme display 254 is presented in which the screen is divided into a number of small regions each of which displays a different programme. From this the user may navigate to a single channel view 256 similar to that of Figure 3, in which the user is presented with a single programme in a window on Web page, together with an electronic programme guide providing programme and time information. Selecting the video picture results in full screen video display 258.

From any one of screen displays 254, 256 and 258, additional information about a programme may be displayed - for example, a brief description and critic's comments - in screen view 260. From this screen and from the full screen video display the user can enter preference information and/or vote on screen 262 to indicate that more (or less) programmes of the type displayed are desired.

Associated programmes and/or Web sites providing further information relating to a programme may be accessed from screen 264 via the single 256 and multi-channel 254 view screens and programme information screen 260. Search screen 268 and search results screen 266 may be accessed as illustrated by the links shown, and also from

NVOD listings screen 270. Further channel choices, including current user restrictions, user defined virtual channel sets, system set-up options and user parameters may be accessed from screen 272; virtual channel schedules may also be defined from this screen, and user and channel data may be imported and exported via screen 274.

The apparatus of Figure 1 is suitable for replacing programme breaks, for example due to commercial advertising, with other supplementary programme material, as described above. The user preference information or other user-characterising information can be used to select the source of supplementary programme material, for example to more specifically target advertising. However, the required functionality can be achieved with apparatus that is simpler than that shown in Figure 1, an example of which is generally shown at 300 in Figure 8.

Programme receiver 304 receives a television programme via input connection 302 to a satellite or terrestrial aerial, cable or telephone line or any other suitable programme source. Supplementary programme material is received at input 306 of receiver 308. Event detector 310 is coupled to the output of programme receiver 304 to detect programme break events and control switch 316 to couple either output 317 of programme receiver 304 or output 318 of receiver 308 to the output 320 of the apparatus.

In the configuration shown, event detector 310 can detect the end of the programme break and switch output 320 back to the programme receiver when the programme continues. In a still simpler embodiment, receiver 308 and switch 316 is dispensed with and event detector 310 controls programme receiver 304 to select a source of supplementary programme material when a programme break is detected; in this case receiver 304 can be returned to the programme source after a predetermined time interval.

Although the programme break replacement system has been described in the context of a system for scheduling television programmes, the system is also useful in

the context of systems suitable for scheduling of programme-type entity, including digital music/audio programmes and computer games.

Many other effective alternatives will occur to those skilled in the art and it is to be understood that the invention is not limited to the described embodiments.

CLAIMS

1. System for providing a home entertainment device (74) with a modified programme channel,
the modified programme channel comprising a schedule of programmes on a programme channel, having modified programme breaks within and/or between the programmes, the apparatus comprising:
a programme reception device (304) to receive the programmes on the programme channel;
a source (306, 308) of supplementary programme material;
output means, coupled to the programme reception device and to the source of supplementary programme material, to output the scheduled programmes and supplementary programme material to the home entertainment device;
programme break detection means (310), coupled to the programme reception device, to detect a break or interruption in a programme; and
switching means (316) , responsive to the programme break detection means to switch the output from the programme to the supplementary programme material.
2. System as claimed in claim 1 wherein the source of supplementary programme material comprises the programme reception device and wherein the switching means switches the programme reception device from the programme channel to a second channel to receive the supplementary programme material.
3. System as claimed in claim 1 wherein the source of supplementary programme material comprises a second programme reception device and wherein the switching means switches to selectively couple one of the programme reception devices to the output means.
4. System as claimed in any preceding claim wherein the switching means is further responsive to a programme reception device to switch the output back from the supplementary programme material to the programme.

5. System as claimed in any preceding claim further comprising:
input means to receive information characterising a user of the apparatus; and
means to select the source of supplementary programme material in response to the user characterising information.
6. System as claimed in claim 5, wherein the user characterising information is preference information characterising an individual user's preferred programmes.
7. System as claimed in claim 6, further comprising means to provide a home entertainment device with a personal channel,
the personal channel comprising a schedule of programmes and corresponding start times, the programmes being selected from programmes available on a plurality of real channels and/or other programme sources, the apparatus further comprising:
database interface means (46) to communicate with a programme database (76) comprising programme information for a plurality of programmes, including for each programme the programme start time, a real channel or other programme source the programme is available from at that start time, and programme descriptor information characterising the content of the programme;
input means (38, 40), to receive the preference information characterising an individual user's preferred programmes;
automatic scheduling means (12) coupled to the database interface means to receive the programme information, to operate on the preference information and programme descriptor information to automatically generate schedule information for a personal channel for the user, the schedule information comprising, for each scheduled programme, programme start time information and information identifying a real channel or other programme source from which the programme is available at that start time;
control means (12) to control a programme reception device using the personal channel schedule information to select and receive, at the scheduled start time, the real channel or programme source corresponding to the scheduled programme;

output means (72) to provide scheduled programmes thus received to the home entertainment device such that the personal channel is selectable by a user of the home entertainment device in a similar way as a real programme channel; and

a user interface (40, 74) for user input of the preference information the user interface being configured to allow a user to input preference weighting for each of a plurality of predetermined program descriptors, and further comprising display means to display a personal channel schedule corresponding to the user's preferences, whereby the user is able to interactively define a personal channel.

8. System as claimed in claim 7

wherein a predetermined program descriptor comprises a set of keywords, and further comprising means to download a set of keywords to the apparatus.

9. System as claimed in claim 8

wherein the user interface further comprises means for a user to define a program descriptor and/or keyword.

10. System as claimed in any one of claims 7 to 9

further comprising user profile input means to define a plurality of user profile descriptors and wherein the user profile descriptors modify the weights of the program descriptors.

11. System as claimed in claim 10

wherein the user profile input means comprises access controlled means to block provision to the contact means of programmes with keywords or descriptors matching programme blocking keywords or descriptors.

12. System as claimed in any preceding claim further comprising local programme material storage means and wherein the source of supplementary programme material is selectable from sources including locally stored programme material.

13. System as claimed in any preceding claim further wherein the supplementary programme material comprises advertising material.
14. A method of providing a home entertainment device (74) with a modified programme channel, the modified programme channel comprising a schedule of programmes on a programme channel, having modified programme breaks within and/or between the programmes, the method comprising:
- receiving the programmes on the programme channel;
 - receiving a source of supplementary programme material;
 - providing the scheduled programmes to the home entertainment device;
 - detecting a break or interruption in a programme; and
 - responsive to the programme break detection providing the supplementary programme material to the home entertainment device.
15. A method as claimed in claim 14 further comprising
- receiving information characterising a user of the apparatus; and
 - selecting the source of supplementary programme material in response to the user characterising information.
16. A method as claimed in claim 15
- wherein the user characterising information is preference information characterising an individual user's preferred programmes.
17. A method as claimed in claim 16 further comprising providing a home entertainment device with a personal channel and wherein the modified programme channel is a said personal channel;
- the personal channel comprising a schedule of programmes and corresponding start times, the programmes being selected from programmes available on a plurality of real channels and/or other programme sources, the method further comprising:
 - receiving programme information from a programme database (76) comprising programme information for a plurality of programmes, including for each programme

the programme start time, a real channel or other programme source the programme is available from at that start time, and programme descriptor information characterising the content of the programme;

receiving preference information characterising a user's preferred programmes including a preference weighting for at least one of a plurality of predetermined program descriptors;

operating on the preference information and programme descriptor information to automatically generate schedule information for a personal channel using the programme information, the schedule information comprising, for each scheduled programme, programme start time information and information identifying a real channel or programme source from which the programme is available at that start time;

controlling a programme reception device (52, 56, 57, 60) using the personal channel schedule information to select and receive, at the scheduled start time, the real channel or programme source corresponding to the scheduled programme;

providing scheduled programmes thus received to the home entertainment device such that the personal channel is selectable by a user of the home entertainment device in a similar way as a real programme channel; and

18. A computer program to, when running, perform the method of any one of claims 14 to 17.

19. The computer program of claim 18, stored on a computer readable medium.

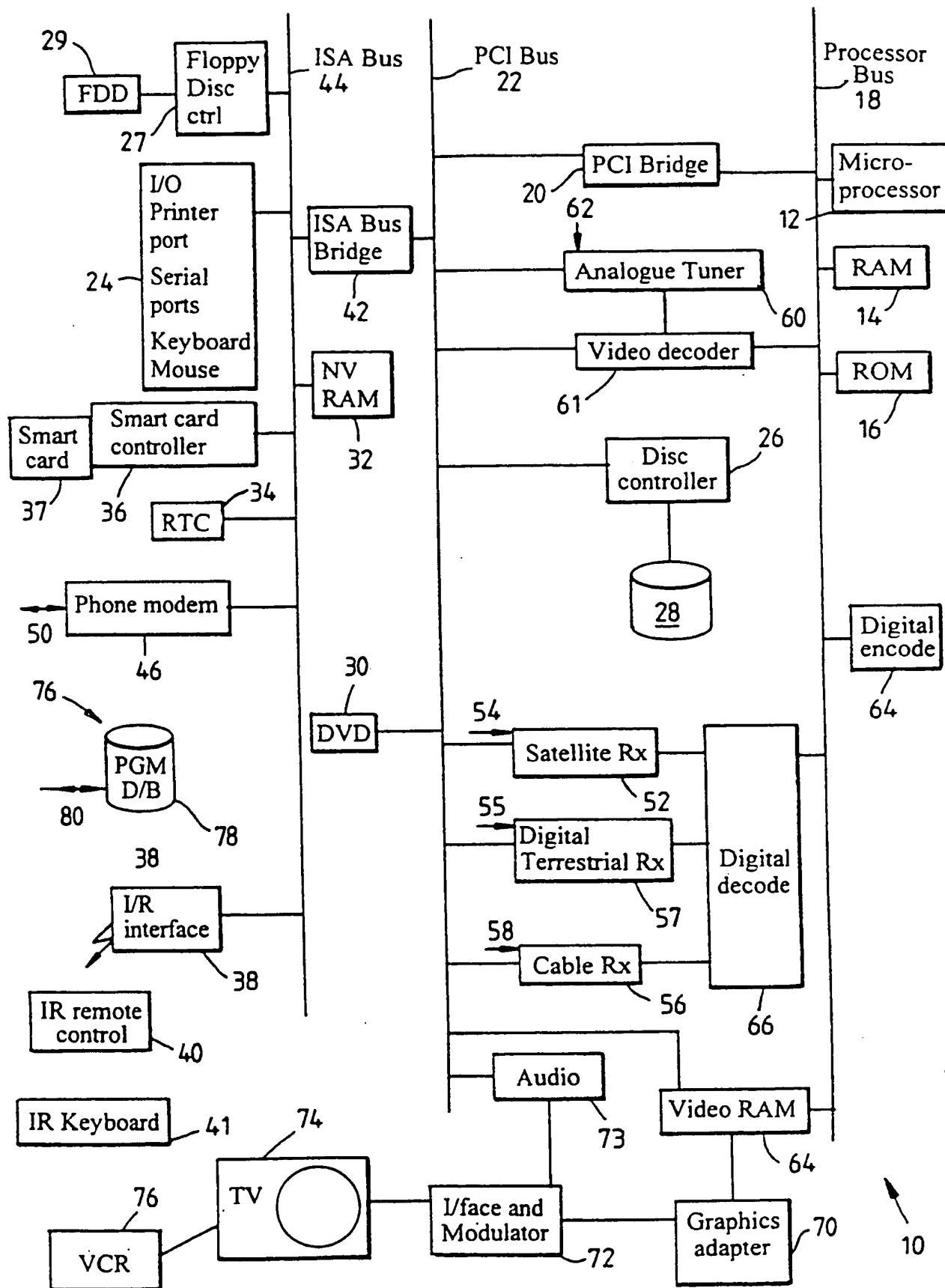


Fig. 1

2/6

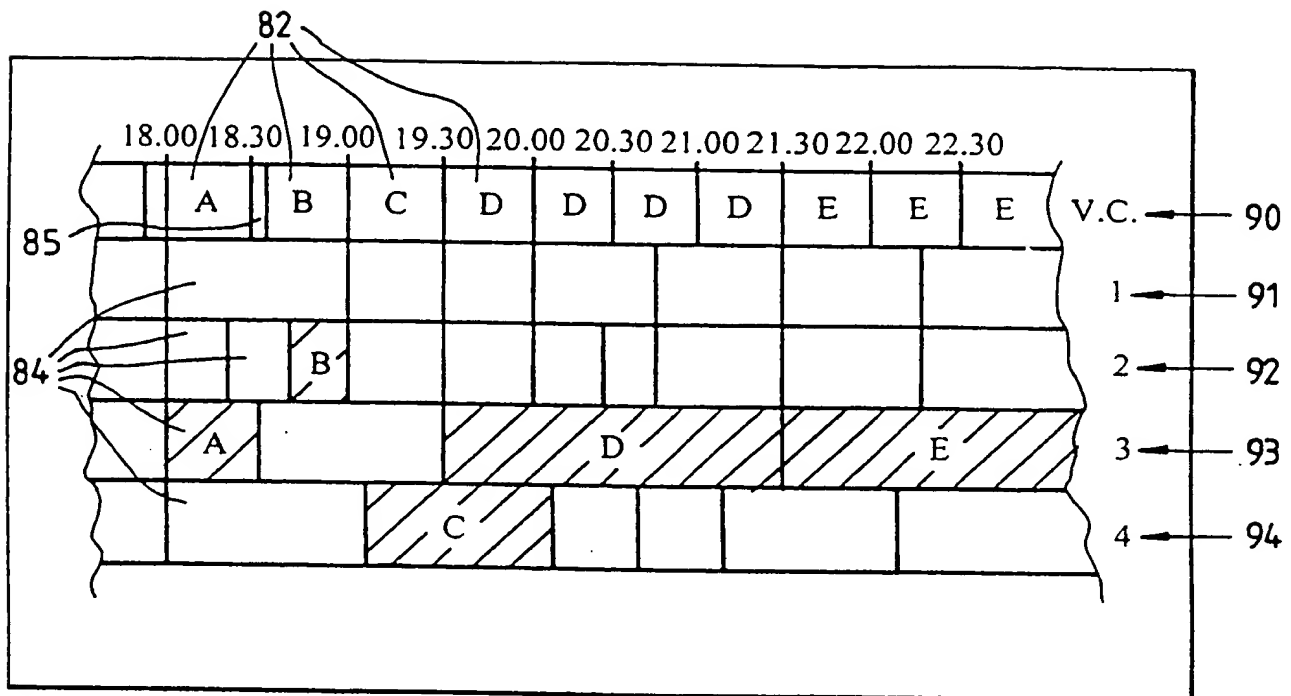


Fig. 2

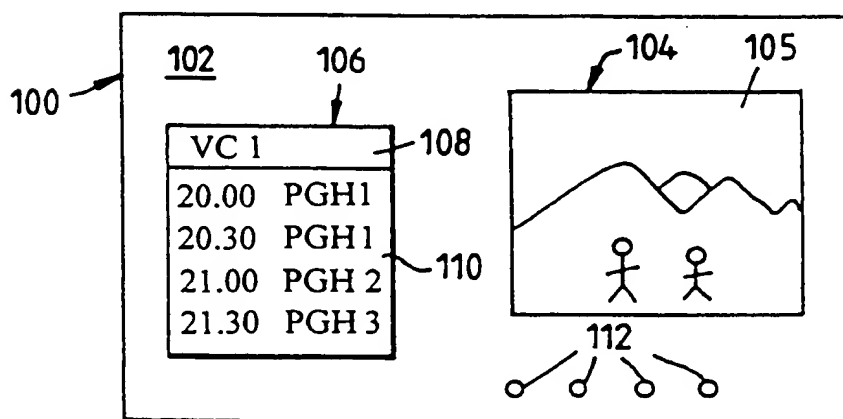
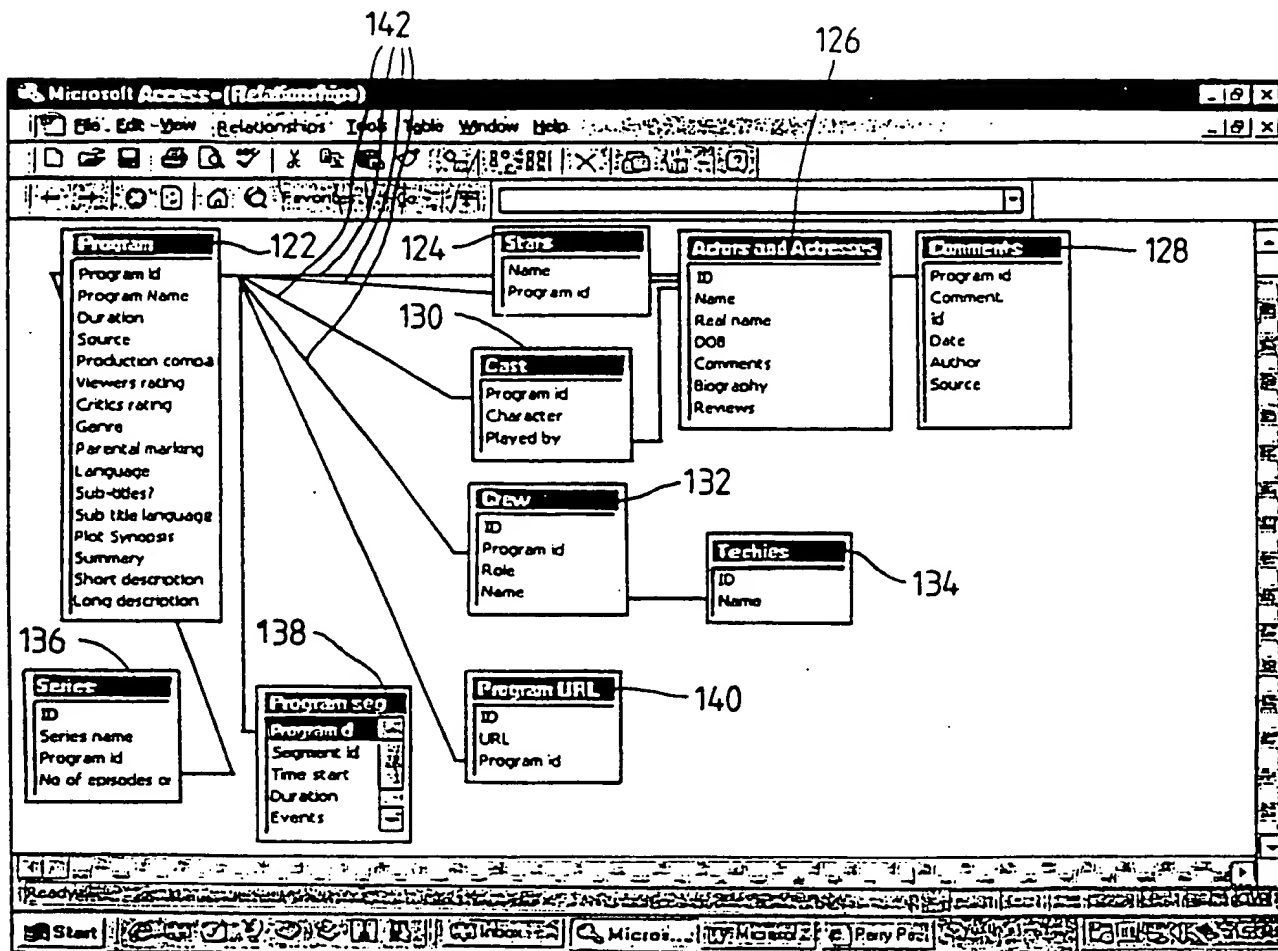


Fig. 3

3/6



120

Fig. 4

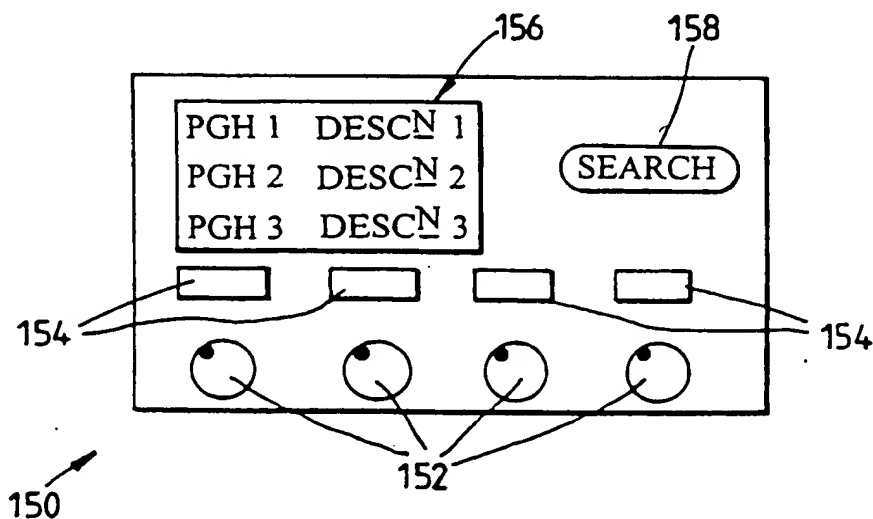


Fig. 5

4/6

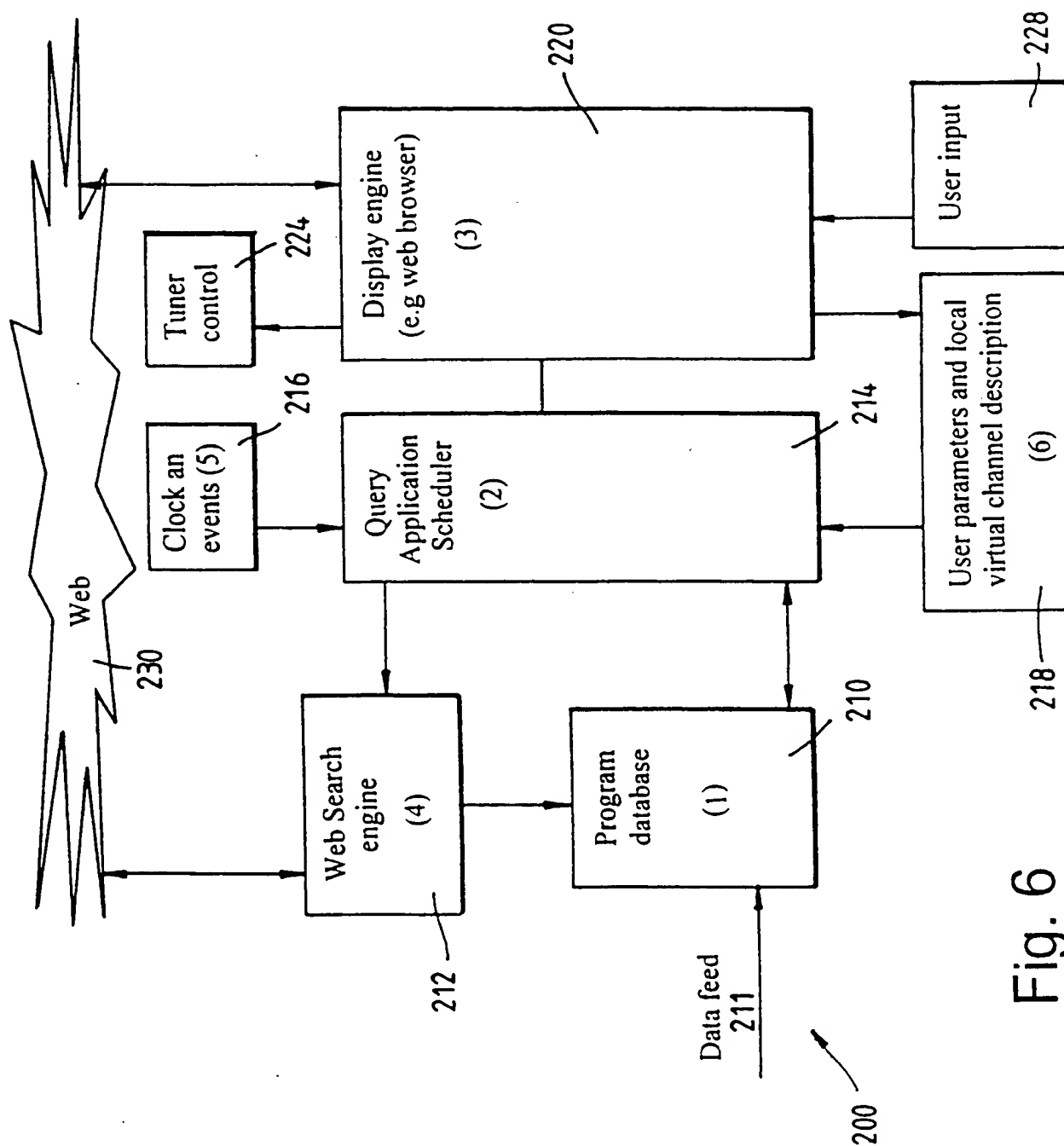


Fig. 6

5/6

User Navigation (schematic):

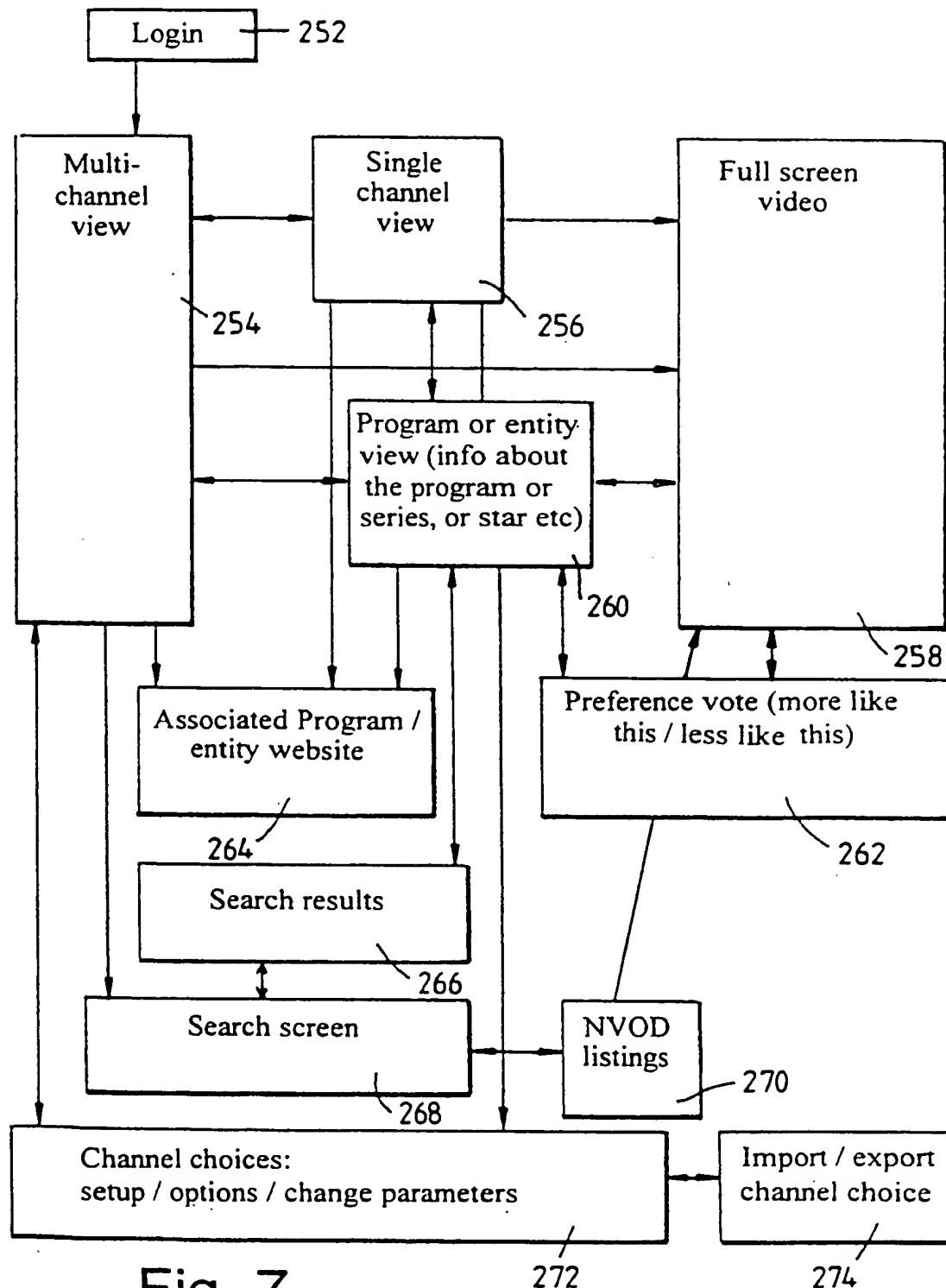


Fig. 7

6/6

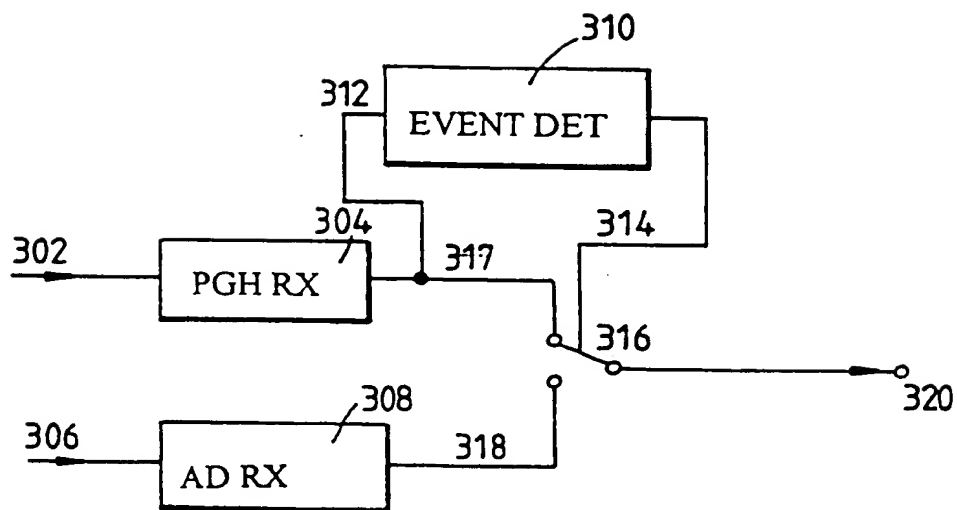


Fig. 8

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 99/04416

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H04N7/16 H04N7/173

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 5 600 573 A (HENDRICKS JOHN S ET AL) 4 February 1997 (1997-02-04) column 5, line 62 -column 6, line 10 column 7, line 7 -column 8, line 39 column 9, line 52 -column 11, line 17 column 15, line 47 -column 19, line 35 column 21, line 10 - line 54 figures 1-8	1-7, 12-19, 8-11
A	EP 0 536 628 A (GEN INSTRUMENT CORP) 14 April 1993 (1993-04-14) cited in the application page 3, column 43, line 7 -page 29 figures 1-3	7-11,17

☐ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents :

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L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

O document referring to an oral disclosure, use, exhibition or other means

P document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

Z document member of the same patent family

Date of the actual completion of the international search

10 April 2000

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Name and mailing address of the ISA

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 99/04416

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